Forgetting of Pictures Over a Long Retention Interval in Young and Older Adults[1]

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Although age-related declines are typically reported for memory of verbal material, it has recently been reported (Park, Puglisi, & Smith, 1986; Park, Puglisi, Smith, & Dudley, 1987; Park, Puglisi, & Sovacool, 1984; Rybarczyk, Hart, & Harkins, 1987) that age-related decrements for picture recognition were not observed in older compared with young adults when both were tested immediately after encoding, even under conditions of nonceiling performance. However, Park, Puglisi, and Smith also measured picture memory after a 4-week retention interval and found that the comparable performance between old and young observed at immediate recognition was not replicable at the delayed interval; older adults performed significantly worse than young adults. This is a particularly interesting finding because Rybarczyk et al. measured picture recognition in young and older adults after a 48-hr interval and reported no evidence for an age-related decline at this interval. If both findings are reliable, this suggests that age-related differences in picture memory will be better understood by measuring retention across a number of intervals.

Park, Puglisi, and Smith (1986) suggested that the age-related differences they reported after a 30-day interval could have several causes. The effect may have been observed because (a) the young learned the initially presented material better, or (b) pictorial memory traces deteriorate more rapidly in older than in young adults, or (c) it was an artifact of the testing procedure. There is no obvious support for the first explanation, inasmuch as young and older adults' performance was equivalent at immediate recognition and well below ceiling. The second explanation, the differential deterioration hypothesis, could not be separated from the third because of the methodology used. Subjects received the same items (both targets and distractors) for recognition at the two testing intervals. Perhaps, older adults' performance deteriorated because they had difficulty separating the distractors from targets due to an inability to discriminate relevant from irrelevant information (Kausler, Kleim, & Overcast, 1975), rather than because of more rapid forgetting of the pictorial traces. The present study corrects for this problem by

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testing subjects' picture recognition for only a subset of the presented material across five different retention intervals, so that subjects never make judgments about either targets or distractors more than once.

METHOD

Subjects

There were 21 research participants in this experiment, 9 undergraduate psychology students and 12 adults aged 60 and over who were active members of a senior recreational organization in Kannapolis, North Carolina. The mean ages of the young and older adults, respectively, were 18.22 and 68.17 years. All of the subjects completed the 30-point Word Familiarity Survey (Gardner & Monge, 1977) and the Older American Resource and Service (OARS) Multidimensional Functional Assessment Questionnaire (Duke University, 1975). The mean vocabulary score of the young adults was 9.44, whereas the older adults scored 16.83—a significant difference, t,(39)= 2.76,$p < .02$. All of the subjects except one college student, perceived their health as *fair* or better.

Stimulus Materials

Stimulus materials consisted of 100 line drawings of complex scenes that were previously used in the Park, Puglisi, and Smith (1986) study. Of the items, 50 served as targets and 50 served as distractors counter-balanced across subjects.

Procedure

Subjects were tested in groups of five or fewer. Subjects were tested immediately after encoding, and then at intervals of 48 hr, 1 week, 2 weeks, and 4 weeks. During the first session, subjects were instructed that they were to study a series of pictures and that their memory for the information would be tested later. A total of 50 items were presented at a 5-s rate via a Kodak Carousel projector. After acquisition, a 3-min filler task was performed, and subjects performed the first of five recognition tasks. During each of the five recognition sessions, subjects received a total of 20 items to evaluate, 10 acquisition items and 10 distractors. Thus, across the five sessions, subjects evaluated all of the study items once, always in the context of never-before presented distractors. A Latin square was used to counterbalance item order across sessions and subjects. During recognition, items were presented at an 8-s rate, and subjects were instructed to respond *yes* if they believed they had studied the item during acquisition and *no* if they did not recognize the item.

RESULTS AND DISCUSSION

Hit rates and false alarms were calculated for each of the five retention intervals for each subject. From these data, corrected recognition scores were derived by subtracting the false alarm rate from the hit rate. We report only the analysis of the corrected recognition data inasmuch as it is the most accurate measure of subjects' memories.

The analysis of the corrected recognition scores included age as a between-groups variable, and retention interval as a within-subjects factor. The analysis yielded an interval main effect, F (4, 76)= 39.59,$p < .001$, because of the increased forgetting across the retention interval. In addition, there was a significant Age × Interval interaction, F (4, 76)= 2.44,$p < .05$. As can be seen in Figure 1, the interaction occurred because the performance of older adults declined more steeply

across the retention interval compared with young adults. Trend analysis supports this conclusion because a significant Age × Intervals linear interaction occurred, F (1, 76)= 12.00,$p < .001$. The difference in slopes is due to differences manifested beyond the 48-hr interval.

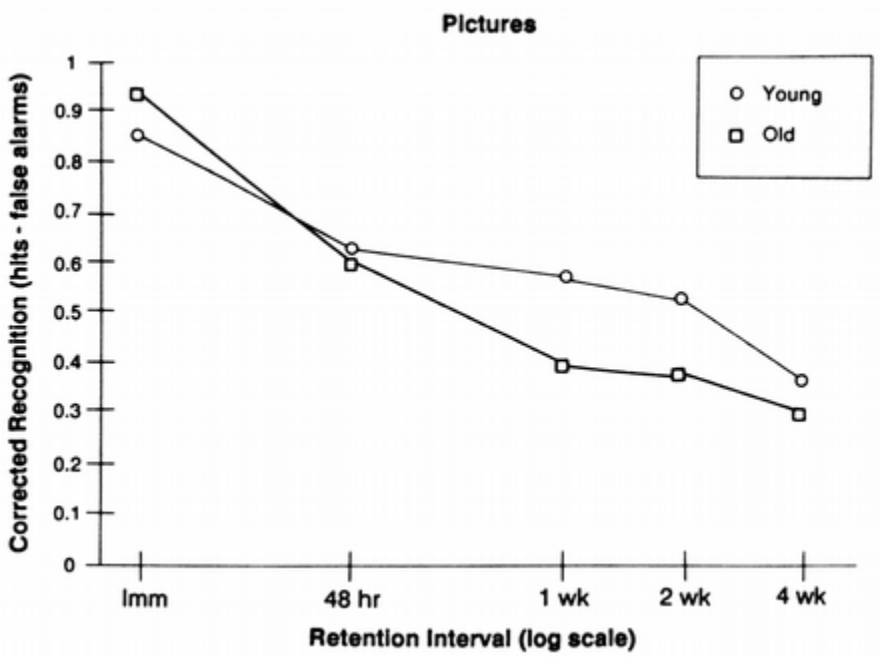

Figure 1. Corrected picture recognition scores for young and older adults across the five retention intervals. (Imm = immediate; wk = week.)

Results of this study suggested that older adults do show increased forgetting for pictures as compared with young adults, but that the decline occurs only after lengthier retention intervals than have typically been studied in the past. As in earlier studies (Park, Puglisi, & Smith, 1986; Park, Puglisi, Smith, & Dudley, 1987; Park, Puglisi, & Sovacool, 1984), we found no evidence that the picture recognition of older adults differs from that of young adults when it is tested shortly after encoding. In fact, the effect persists 2 days after acquisition, just as Rybarczyk et al. (1987) reported. It was only by testing subjects 1 week later, that differences in memory for the pictures were observed. Thus, we replicated both the Rybarczyk et al. finding for no differences up to 2 days, as well as the Park, Puglisi, and Smith (1986) finding in which no age difference for picture recognition was observed at immediate recall, but a difference was found 4 weeks later. Park, Puglisi, and Smith had speculated that the difference at 4 weeks between old and young may have been an artifact of the methodology. However, because the present study corrected for methodological problems present in the earlier study, the interaction appears to be reliable, particularly because it also replicates the Rybarczyk et al. data. The interaction also pinpoints the decline as beginning between 2 days and 1 week after encoding. This finding is not due to ceiling effects at immediate retention, particularly because it is still maintained 48 hr later, after a substantial drop in memory performance has occurred.

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